	LECTURE PLAN **Sub Code & Name: NEC-501 Integrated Circuits** **Unit : V** **Branch : ECE** **Semester:VI**	**LP – NEC501** **Date: 27/7/2017** **Page 01 of 06**

Analog Integrated circuit Design: an overview: Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror

The 741 IC Op-Amp: Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; D**C** Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between fᵤnd SR

Objective:

- To introduce the basics of integrated circuit fabrication techniques.
- The basic building blocks of linear integrated circuits are introduced.

Session No.	Topics to be covered	Time	Ref	Teaching Method
1.	Introduction to Simple current Mirror, Current Mirrors using BJT and MOSFETs	50m	1,2	BB
2.	Base current compensated current Mirror	50m	1,2	BB
3.	Wilson and Improved Wilson Current Mirrors	50m	1,2	BB
4.	Widlar Current source and Cascode current Mirror	50m	1,2	BB
5.	Problems	50m	1,2	BB
6.	Types of current sources; Level shifters	50m	1,2	BB
7.	BJT Differential amplifier with active loads; Output stage of an op amp	50m	2,4	BB
8.	Bias circuit, short circuit protection circuitry,	50m	2,4	BB
9.	the input stage, the second stage of ic 741	50m	2,4	BB
10.	the output stage, and device parameters	50m	1,2	BB
11.	problems	50m	2,3	BB
12.	D**C** Analysis of 741: Small Signal Analysis of input stage	50m	2,3	BB
13.	D**C** Analysis of 741: the second stage, the output stage	50m	2,3	BB
14.	Gain, Frequency Response of 741	50m	2,3	BB,OHP
15.	A Simplified Model, Slew Rate, Relationship Between fᵤnd SR	50m	2,3	BB,OHP
16.	Problems	50m	2,3	BB,OHP

UNIT II Linear Applications of IC op-amps

An Overview of Op-Amp (ideal and non-ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors

Filters: First and second order LP, HP, BP BS and All pass active filters, KHN.

Objectives:

- Open loop & closed loop configurations of Op-amp
- The linear and non-linear applications of operational amplifiers

Session No.	Topics to be covered	Time	Ref	Teaching Method
17.	Open loop & closed loop configurations of Op-amp Sign Changer, Scale Changer, Phase Shift Circuits, all input & output waveform relationships	50m	1,2,8	BB
18.	Voltage Follower, V-to-I converters List of some applications for the above	50m	1,2	BB
19.	I-to-V converters, Adder	50m	1,2	BB
20.	Subtractor, Combined effect, Instrumentation amplifier	50m	1,2,7	BB
21.	Comparison of all converters V/F & F/V converters	50m	1,2,7	BB
22.	Integrator and Practical Integrator	50m	1,2,5	BB
23.	Differentiator and Practical Differentiator	50m	1,2,5	BB
24.	Comparators and various applications of comparators	50m	1,2,5	BB
25.	Schmitt trigger and Precision rectifiers, Logarithmic amplifier	50m	1,2,5	BB
26.	Antilogarithmic amplifier, Peak detector Applications, Clippers	50m	1,2	BB
27.	Clamper –applications. Introduction & types of active filters, Low pass filters	50m	1,2,5	BB
28.	High-pass and band-pass Butterworth filters.	50m	1,2,5	BB

	LECTURE PLAN **Sub Code & Name: NEC-501 Integrated Circuits** **Unit : II** **Branch : ECE** **Semester:V**	**LP – NEC501** **Date: 27/7/2017** **Page 03 of 06**

UNIT III Digital Integrated Circuit Design

An Overview: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates

Latches and Flip flops: The Latch, The SR Flip-flop, CMOS Implementation of SR Flipflops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits..

Objective: To introduce the theory and applications of analog multipliers and PLL.

Session No.	Topics to be covered	Time	Ref	Teaching Method
30.	CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters	50m	1,2	BB
31.	CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters	50m	1,2	BB
32.	AND, OR, NAND implementation using CMOS	50m	1,5	BB
33.	NOR Gates,XOR gate implementation using CMOS	50m	1	BB
34.	CMOS Implementation of boolean expression.	50m	1	BB
35.	The Latch, The SR Flip-flop	50m	1	BB
36.	CMOS Implementation of SR Flipflops	50m	1	BB
37.	A Simpler CMOS Implementation of the Clocked SR Flip-flop	50m	1	BB
38.	D Flip-flop Circuits	50m	1	BB
39	Problems	50m	1	-

	LECTURE PLAN Sub Code & Name: NEC-501 Integrated Circuits Unit : III Branch : ECE Semester:V	LP – NEC501 Date: 27/7/2017 Page 04 of 06

UNIT IV Non-Linear applications of IC Op-amps

Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Opamp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multivibrator, Monostablemultivibrator, Generation of Triangular Waveforms

Objective:

To introduce the concept of converters with respect to Digital & analog signals.

Session No.	Topics to be covered	Time	Ref	Teaching Method
39.	Introduction of Log–Anti Log Amplifiers	50m	2,5	BB
40.	Precision Rectifiers, Peak Detectors	50m	2,5	BB
41.	Sample and Hold Circuits	50m	2,5	BB
42.	Analog Multipliers	50m	2	BB
43.	Analog Multipliers and their applications.	50m	2,3	BB
44.	Opamp as a comparator, Zero crossing detector	50m	2,3	BB
45.	Inroduction of Schmitt Trigger,Problems	50m	2,3	BB
46.	Astable multivibrator,,Monostable multivibrator	50m	1,5	BB,OHP
47.	Generation of Triangular Waveforms	50m	9	BB

	LECTURE PLAN **Sub Code & Name: NEC-501 Integrated Circuits** **Unit : IV** **Branch : ECE** **Semester:V**	**LP – NEC501** **Date: 27/7/2017** **Page 05 of 06**

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs

D/A and A/D converters
Integrated Circuit Timer: The 505 Circuit, Implementing a MonostableMultivibrator Using the 505 IC, AstableMultivibrator Using the 505 IC.
Phase locked loops (PLL): Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL

Objective:

- To introduce the concepts of different waveforms & their generation using 505timer& op. amps.
- To introduce some special function ICs.

Session No.	Topics to be covered	Time	Ref	Teaching Method
48.	Sine wave generators/oscillator circuits using diodes & transistors along with op. amps. Introduction to Timer IC505- circuit aspect	50m	2,6	BB,OHP
49.	Introduction to & types of Multivibrators Design of Astable multivibrator & Monostable multivibrators	50m	2,6	BB,OHP
50	Introduction to PLL, Different blocks of a PLL IC Operation of PLL	50m	2	BB
51	Phase Detector types, Voltage Controlled Oscillator	50m	2	BB
52	Derivation of Lock-in-range and Capture range	50m	2	BB
53.	Closed loop analysis,IC565, Monolithic 566	50m	2,5	BB,OHP
54.	Introduction to analog & digital data converters and the need for the same. Different types of switches & resistances used for the same	50m	2,5	BB,OHP
50.	Specifications of D/A converters, 4 bit Weighted resistor type of D/A	50m	2,5	BB,OHP
56.	R-2R ladder type of D/A converter, Voltage & Current mode	50m	2	BB,OHP
58.	A/D converters, Specifications. Types of A/D converters	50m	2	BB
59.	Flash type converter, Successive Approximation type converter	50m	1,2	BB

TEXT BOOKS:

1 .Sedra and Smith, "Microelectronic Circuits", 6thEdition, Oxford University Press.
2. Michael Jacob, "Applications and Design with Analog Integrated Circuits", PHI, 2ndEdition.

REFERENCES:

3. B.S.Sonde, System design using Integrated Circuits , New Age Pub, 2nd Edition, 2001
4. Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 2005.
5. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall / Pearson Education, 4th Edition, 2001.
6. J.Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1996.
7. William D.Stanley, Operational Amplifiers with Linear Integrated Circuits, Pearson Education, 2004.
8. K Lal Kishore, Operational Amplifier and Linear Integrated Circuits, Pearson Education, 2006.
9. S.Salivahanan & V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008.

	Updated by	**Approved by**
Signature		
Name	**Ram Racksha Tripathi**	**Prof. C.B.Jha**
Designation	**Asst.Prof**	**Dean Academic**
Date	**27/7/2017**	**27/7/2017**